

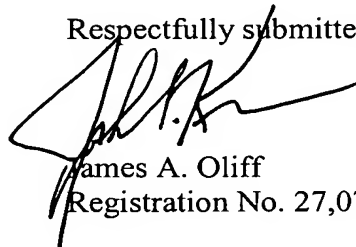
REMARKS

Claims 1-23 are pending in this application. By this Supplemental Preliminary Amendment, the title, abstract, specification and claims 1-23 are amended. No new matter is added.

The attached Appendix includes marked-up copies of the substitute specification (37 C.F.R. §1.125(b)(2)) and claims (37 C.F.R. §1.121(c)(1)(ii)).

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,



James A. Oliff
Registration No. 27,075

John S. Kern
Registration No. 42,719

JAO:JSK/dlh

Attachments:

Substitute Abstract
Substitute Specification along with marked-up
copy showing the changes made thereto
Appendix

Date: May 31, 2002

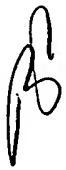
OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

**DEPOSIT ACCOUNT USE
AUTHORIZATION**

Please grant any extension
necessary for entry;
Charge any fee due to our
Deposit Account No. 15-0461



ABSTRACT

The invention provides an organic silane molecular film, having a thickness of 3 nm or less and an aromatic hydrocarbon group as a part of the molecular structure of the film that is formed on the surface of the substrate. Accordingly, a molecular film pattern can be efficiently formed by using a molecular film having a superior photolytic property. Additionally, the invention can provide a patterning technique that can easily form a molecular film pattern at a high speed with the number of steps of manufacturing a semiconductor device, as well as the cost, being reduced.

APPENDIX

Changes to Title:

The following is a marked-up version of the amended title:

~~MANUFACTURING METHOD OF MOLECULAR FILM PATTERN, MOLECULAR FILM PATTERN, MANUFACTURING METHOD OF SEMICONDUCTOR DEVICE, SEMICONDUCTOR DEVICE, MANUFACTURING METHOD OF ELECTRO-OPTICAL DEVICE, ELECTRO-OPTICAL DEVICE, MANUFACTURING METHOD OF ELECTRONIC DEVICE, AND ELECTRONIC APPARATUS~~SYSTEM AND METHODS FOR MANUFACTURING A MOLECULAR FILM PATTERN

Changes to Abstract:

The following is a marked-up version of the amended Abstract:

~~_____ [Object] A molecular film having various functional groups, which is formed on a substrate, can be easily patterned by ultraviolet light; however, patterning which can be performed in a more shorter time has been desired.~~

~~[Solving Means] An~~ The invention provides an organic silane molecular film, having a thickness of 3 nm or less and an aromatic hydrocarbon group as a part of the molecular structure of the film; that is formed on the surface of the substrate. Accordingly, a molecular film pattern can be efficiently formed by using a molecular film having a superior photolytic property. Additionally, the invention can provide a patterning technique that can easily form a molecular film pattern at a high speed with the number of steps of manufacturing a semiconductor device, as well as the cost being reduced.

~~[Selected Figure] _____~~ Fig. 1

Changes to Specification:

A Substitute Specification is attached in accordance with 37 C.F.R. 1.125(b)(2).

Changes to Claims:

The following are marked-up versions of the amended claims:

1. (Amended) A method for manufacturing a molecular film pattern,
comprising:

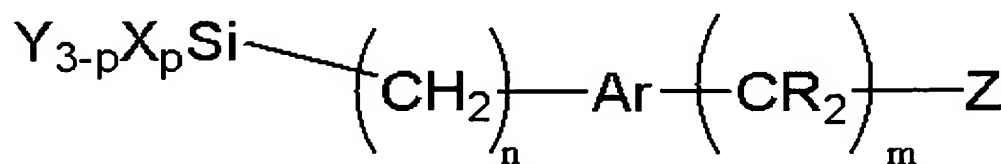
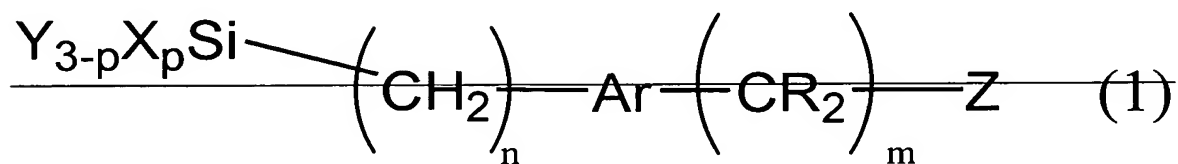
~~a step of forming a molecular film by using a photolytic organic silicon compound that contains an aromatic hydrocarbon group, as a starting material; and a step of~~
_____ irradiating the molecular film with a light.

2. (Amended) A method for manufacturing a molecular film pattern,
comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material; the organic silicon compound having a chemical structure represented by the following formula (1); and a step of~~

_____ irradiating the molecular film with a light;

_____ [Chemical 1] the organic silicon compound having a chemical structure represented by



wherein n, m, p, Ar, X, Y, and R ~~in the formula~~ are as follows:

n is an integer of 0 or more;

m is an integer of 0 or more;

p is an integer of 0 or more;

Ar is an aryl group;

R is a hydrogen atom or a fluorine atom;

X is a halogen group ~~such as~~ including a chlorine group, an amino group, or an alkoxyl group;

Y is an alkyl group, an aryl group, or a hydrogen atom; and

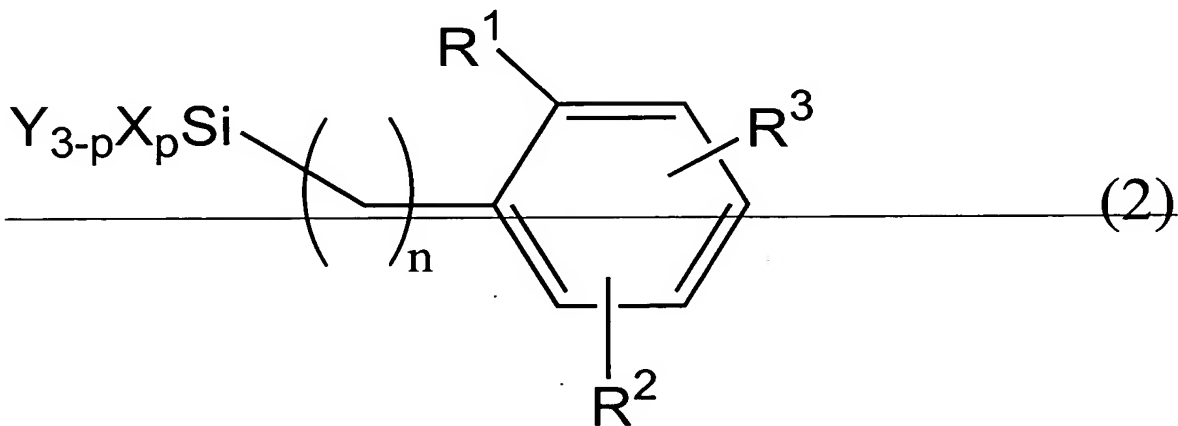
Z is an alkyl group, a perfluoroalkyl group, a silyl group, a cyano group, an amino group, or a thiol group.

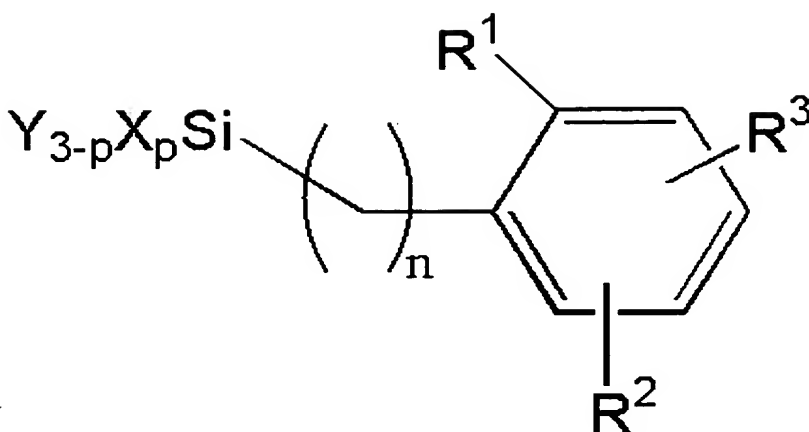
3. (Amended) A method for manufacturing a molecular film pattern, comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (2); and~~

~~_____ a step of irradiating the molecular film with a light;~~

~~_____ [Chemical 2] the organic silicon compound having a chemical structure represented by~~





wherein n , p , R^1 , R^2 , R^3 , X , and Y in the formula are as follows:

n is an integer of 0 or more;

p is an integer of 0 or more;

R^1 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

R^2 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, or an alkyl group containing an organic silicon group;

R^3 is a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, an alkyl group containing an organic silicon group, an aryl group, or an alkyl group containing an aryl group;

X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group; and

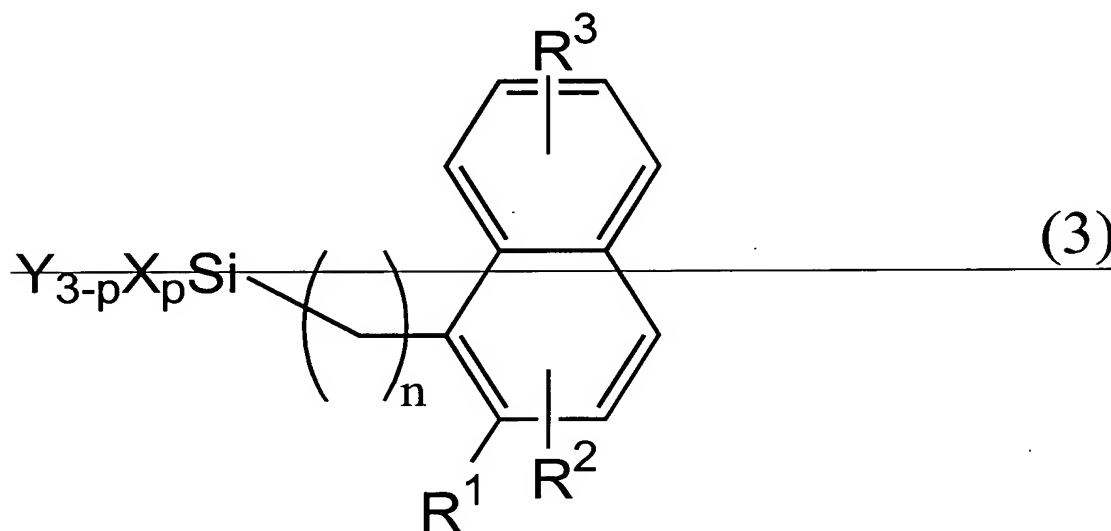
Y is an alkyl group or an aryl group.

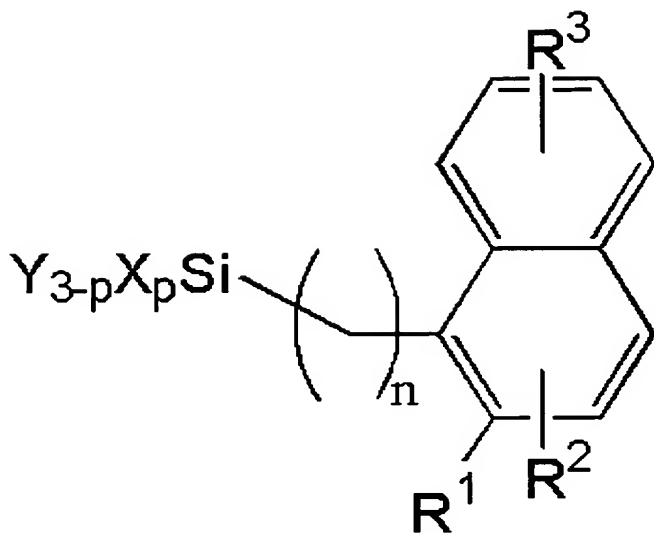
4. (Amended) A method for manufacturing a molecular film pattern, comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (3); and~~

~~_____ a step of irradiating the molecular film with a light;~~

~~_____ [Chemical 3] the organic silicon compound having a chemical structure represented by~~





wherein n , p , R^1 , R^2 , R^3 , X , and Y in the formula are as follows:

n is an integer of 0 or more;

p is an integer of 0 or more;

R^1 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

R^2 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, or an alkyl group containing an organic silicon group;

R^3 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino

group, an alkyl group containing an alkylamino group, an organic silicon group, or an alkyl group containing an organic silicon group;

X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group; and

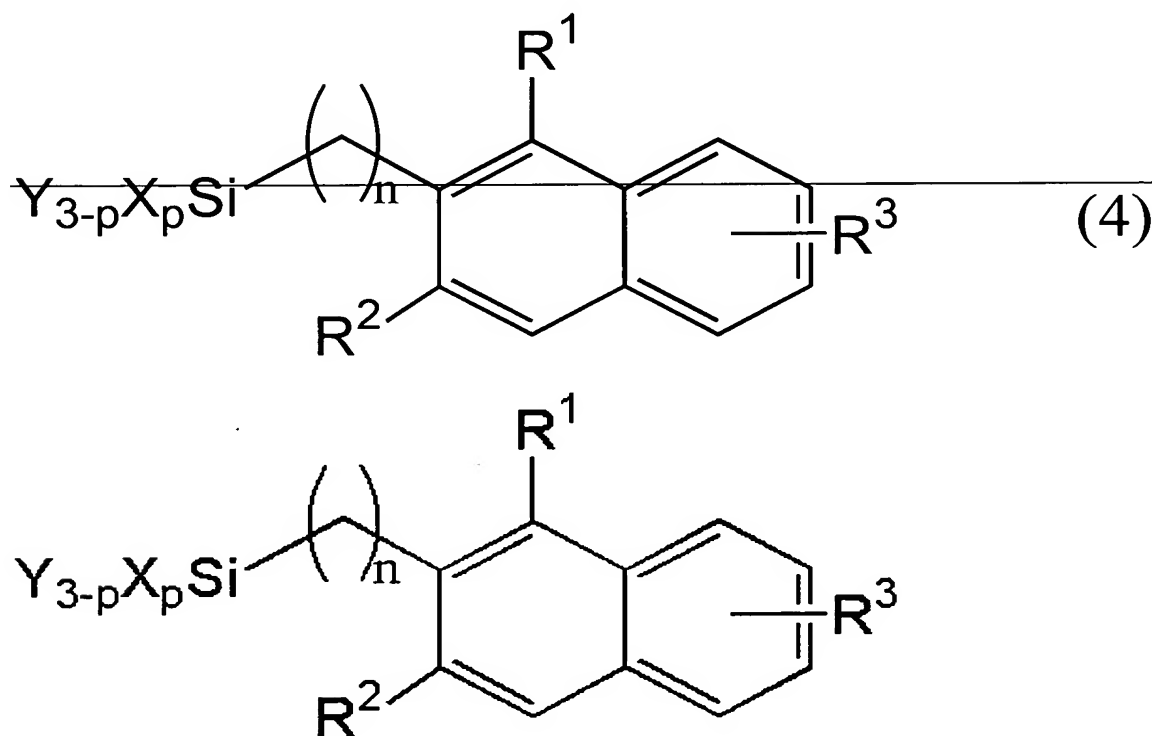
Y is an alkyl group or an aryl group.

5. (Amended) A method for manufacturing a molecular film pattern, comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (4); and a step of~~

~~_____ irradiating the molecular film with a light;~~

~~_____ [Chemical 4] the organic silicon compound having a chemical structure represented by~~



wherein n , p , R^1 , R^2 , R^3 , X , and Y ~~in the formula~~ are as follows:

n is an integer of 0 or more;

p is an integer of 0 or more;

R^1 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

R^2 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, or an alkyl group containing an organic silicon group;

R^3 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, or an alkyl group containing an organic silicon group;

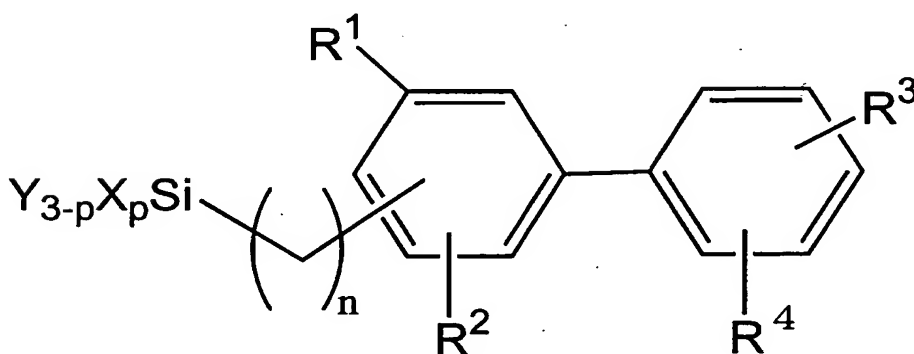
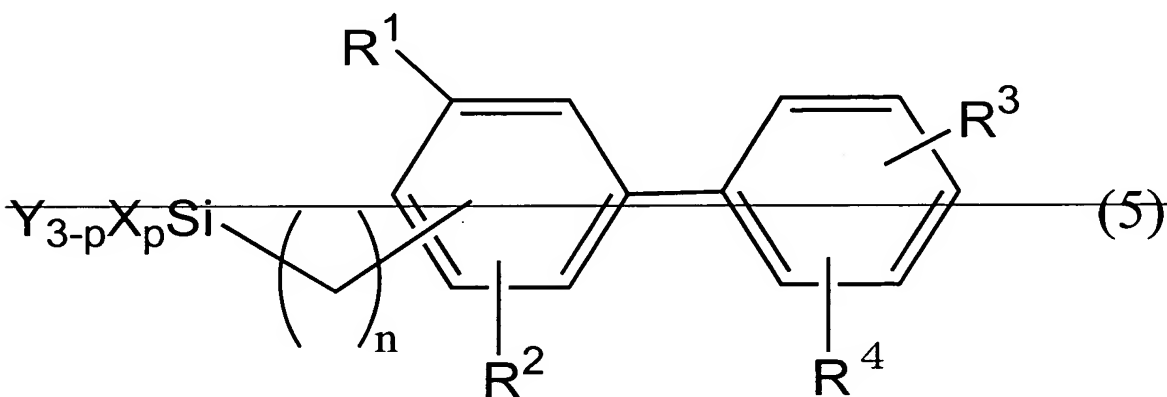
X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group; and

Y is an alkyl group or an aryl group.

6. (Amended) A method for manufacturing a molecular film pattern, comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (5); and a step of~~
_____ irradiating the molecular film with a light;

_____ [Chemical 5] the organic silicon compound having a chemical structure represented by



wherein n , p , R^1 , R^2 , R^3 , R^4 , X , and Y in the formula are as follows:

n is an integer of 0 or more;

p is an integer of 0 or more;

R^1 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxy group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

R^2 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, or an alkyl group containing an organic silicon group;

R^3 is a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, or an alkyl group containing an organic silicon group;

R^4 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, or an alkyl group containing an organic silicon group;

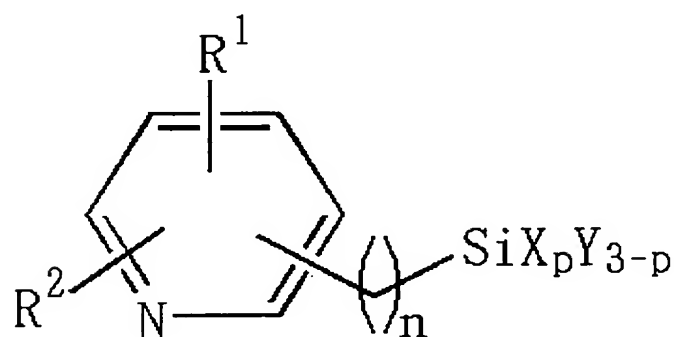
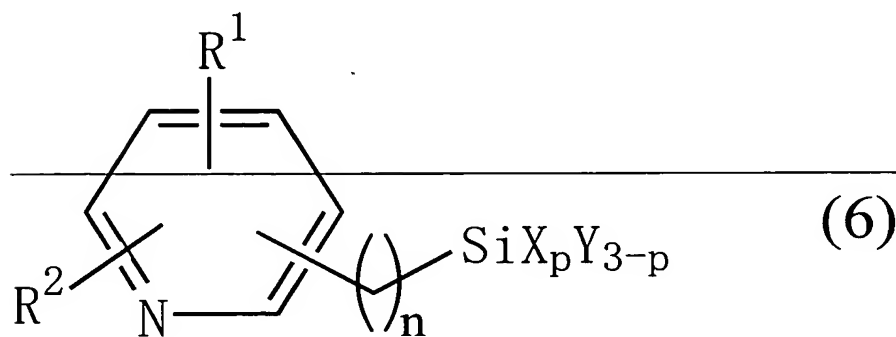
X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group; and

Y is an alkyl group or an aryl group.

7. (Amended) A method for manufacturing a molecular film pattern, comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (6); and a step of~~
_____ irradiating the molecular film with a light;

[Chemical 6] the organic silicon compound having a chemical structure represented by



wherein n , p , R^1 , R^2 , X , and Y in the formula are as follows:

n is an integer of 0 or more;

p is an integer of 0 or more;

R^1 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

R^2 is a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl

group containing an alkylamino group, an organic silicon group, an alkyl group containing an organic silicon group, an aryl group, or an alkyl group containing an aryl group;

X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group; and

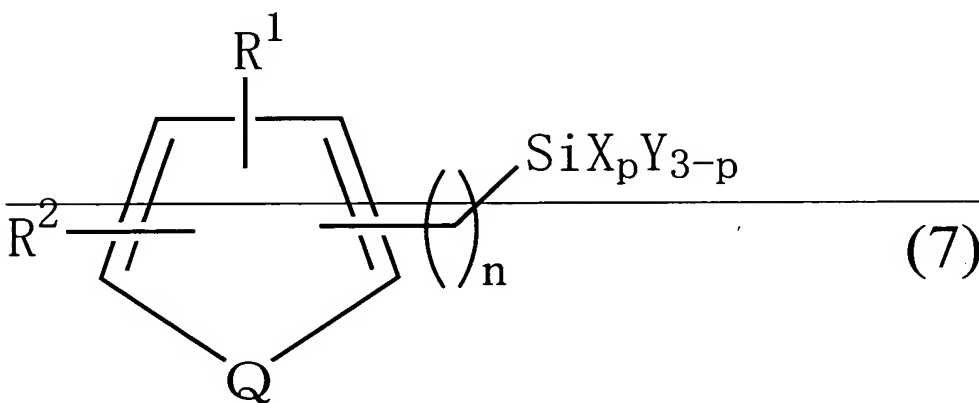
Y is an alkyl group or an aryl group.

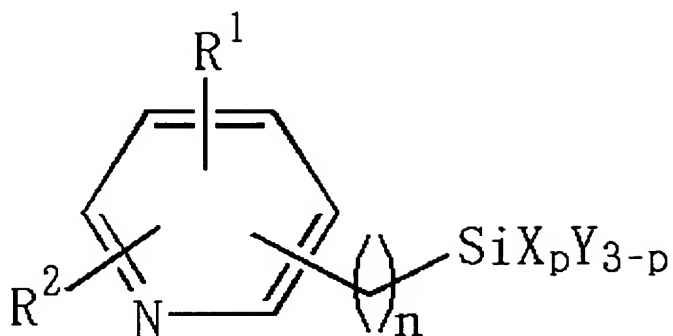
8. (Amended) A method for manufacturing a molecular film pattern, comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (7); and a step of~~

~~_____ irradiating the molecular film with a light;~~

~~_____ [Chemical 7] the organic silicon compound having a chemical structure represented by~~





wherein n , p , R^1 , R^2 , X , Y , and Q in the formula are as follows:

n is an integer of 0 or more;

p is an integer of 0 or more;

R^1 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

R^2 is a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, an alkyl group containing an alkylamino group, an organic silicon group, an alkyl group containing an organic silicon group, an aryl group, or an alkyl group containing an aryl group;

X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group;

Y is an alkyl group or an aryl group; and

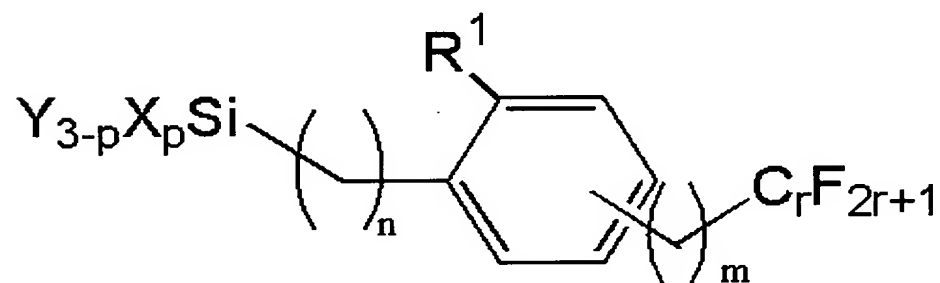
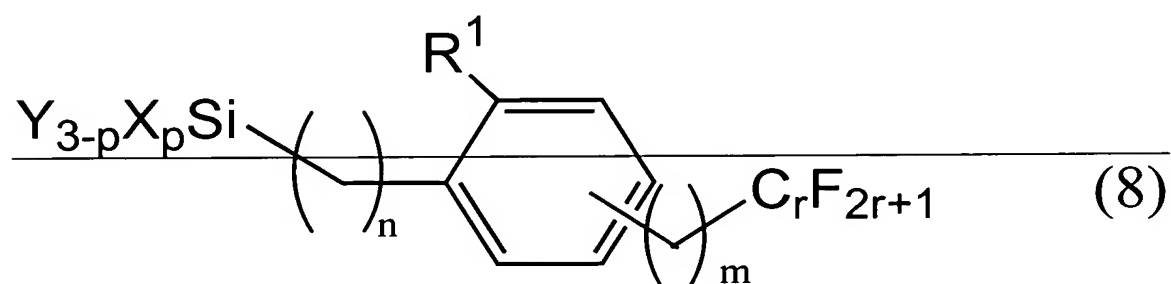
Q is a nitrogen (N) atom, an oxygen (O) atom, or a sulfur (S) atom, each having a hydrogen atom or an alkyl group.

9. (Amended) A method for manufacturing a molecular film pattern, comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (8); and a step of~~

_____ irradiating the molecular film with a light;

~~[Chemical 8]~~ the organic silicon compound having a chemical structure represented by



wherein n, m, r, p, R¹, X, and Y in the formula are as follows:

n is an integer of 0 or more;

m is an integer of 0 or more;

r is a positive integer;

p is an integer of 0 or more;

R¹ is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group; and

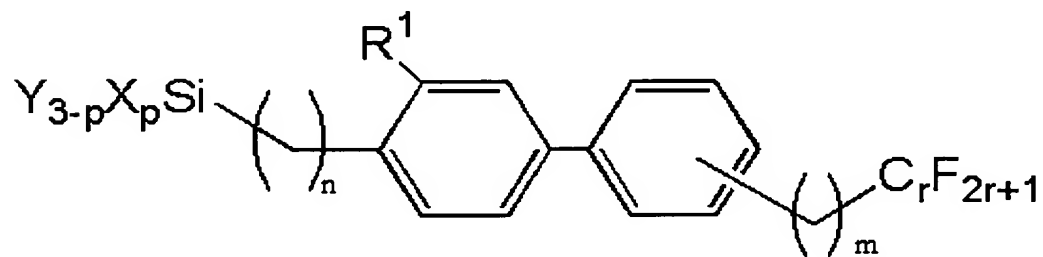
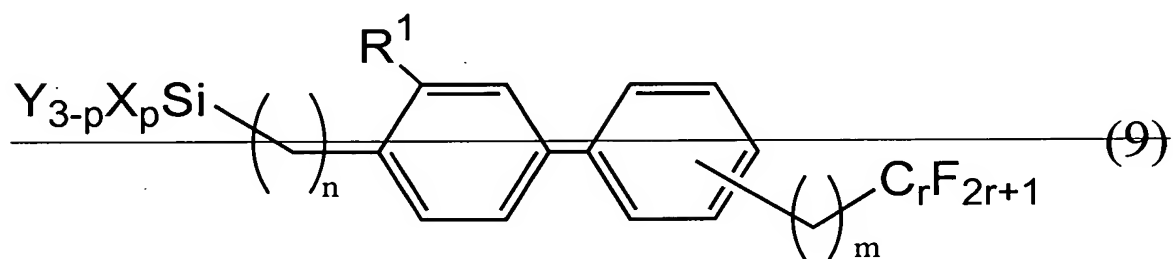
Y is an alkyl group or an aryl group.

10. (Amended) A method for manufacturing a molecular film pattern, comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (9); and a step of~~

~~_____ irradiating the molecular film with a light;~~

~~_____ [Chemical 9] the organic silicon compound having a chemical structure represented by~~



wherein n, m, r, p, R¹, X, and Y in the formula are as follows:

n is an integer of 0 or more;

m is an integer of 0 or more;

r is a positive integer;

p is an integer of 0 or more;

R¹ is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group; and

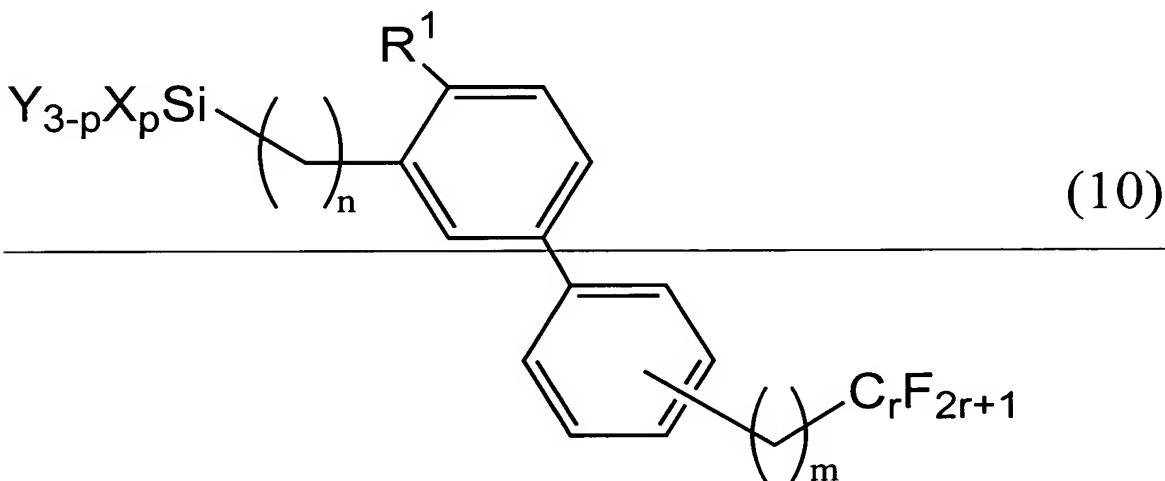
Y is an alkyl group or an aryl group.

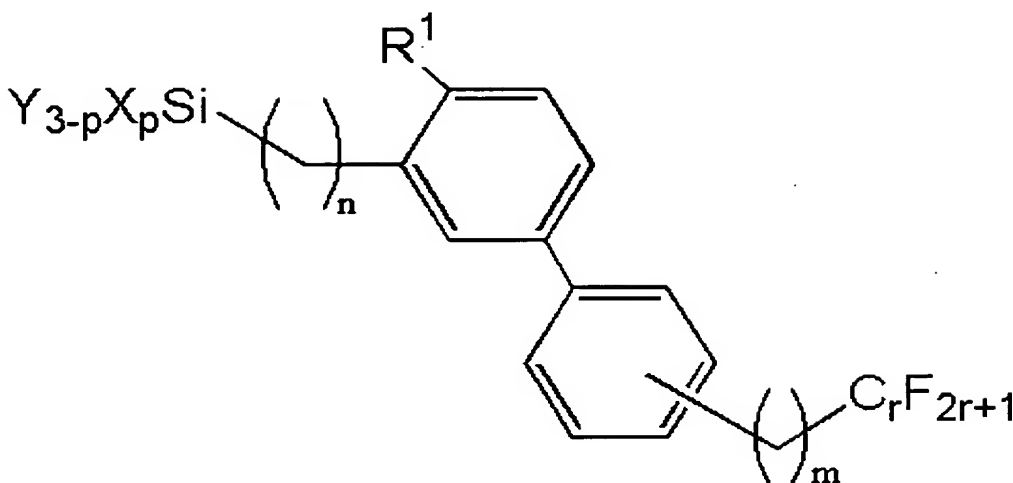
11. (Amended) A method for manufacturing a molecular film pattern,
comprising:

~~a step of forming a molecular film by using an organic silicon compound as a starting material, the organic silicon compound having a chemical structure represented by the following formula (10); and a step of~~

_____ irradiating the molecular film with a light;

_____ [Chemical 10] the organic silicon compound having a chemical structure represented by





wherein n , m , r , p , R^1 , X , and Y in the formula are as follows:

n is an integer of 0 or more;

m is an integer of 0 or more;

r is a positive integer;

p is an integer of 0 or more;

R^1 is a hydrogen atom, a halogen atom, a perfluoroalkyl group, a hydroxyl group, a thiol group, an amino group, an alkylamino group, an alkoxyl group, an alkyl group containing a hydroxyl group, an alkyl group containing a thiol group, an alkyl group containing an amino group, or an alkyl group containing an alkylamino group;

X is a halogen group such as a chlorine group, an amino group, or an alkoxyl group; and

Y is an alkyl group or an aryl group.

12. (Twice Amended) A-~~The~~ method for manufacturing a molecular film pattern according to Claim 3,

~~wherein~~ R^1 of the organic silicon compound is being a perfluoroalkyl group.

13. (Twice Amended) A-~~The~~ method for manufacturing a molecular film pattern according to Claim 3,

~~wherein~~ R^1 of the organic silicon compound is being a trifluoromethyl group.

14. (Twice Amended) ~~A-The~~ method for manufacturing a molecular film pattern according to Claim 1,

~~wherein the thickness of the molecular film is being~~ 3 nm or less.

15. (Twice Amended) ~~A-The~~ molecular film pattern formed by a method for manufacturing a molecular film pattern according to Claim 1.

16. (Twice Amended) A method for manufacturing a semiconductor device further comprising:

~~a step of~~ forming a molecular film pattern according to ~~a~~ the method for manufacturing a molecular film pattern recited in Claim 1.

17. (Amended) A semiconductor device formed by ~~a~~ the method for manufacturing a semiconductor device according to Claim 16.

18. (Twice Amended) A method for manufacturing an electro-optical device, comprising:

~~a step of~~ forming a molecular film pattern according to ~~a~~ the method for manufacturing a molecular film pattern recited in Claim 1.

19. (Amended) An electro-optical device formed by ~~a~~ the method for manufacturing an electro-optical device according to Claim 18.

20. (Amended) ~~A-The~~ semiconductor device according to Claim 17, ~~wherein the semiconductor device comprises~~ comprising an area composed of an organic material.

21. (Amended) ~~An-The~~ electro-optical device according to Claim 19, ~~wherein the electro-optical device comprises~~ comprising an organic electroluminescent element.

22. (Twice Amended) A method for manufacturing an electronic device comprising:

a step performed by using a the method for manufacturing a molecular film pattern recited in Claim 1.

23. (Twice Amended) An electronic apparatus comprising ~~an~~ the electro-optical device according to Claim 19 as a display portion.